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LIGHTING DATA

EDISON LAMP WORKS

GENERAL SALES OFFICES

HARRISON, N. J.

The Lighting of Show Windows and Show Cases



Information compiled by

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Lighting Service Department

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For information regarding MAZDA lamps and lighting questions, refer to the nearest sales office as listed on the last page of this bulletin.

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THE EDISON LAMP WORKS
GENERAL ELECTRIC COMPANY

The Lighting of Show Windows and Show Cases

*Information Compiled by A. L. Powell
Lighting Service Department*

Reasons for Show Window Lighting

The enormous advertising value of the show window is not to be doubted. Every progressive merchant realizes this, and huge sums of money are spent for show windows. Anyone walking along the sidewalk during the day will stop to look at a striking display in a window. At night the window display not only attracts, but the contrast of the brightly lighted area against the relatively darker portions of the building compels attention. The show window of the store represents a relatively large investment, and its fixed charges are heavy in that its space is taken from the store area and of course the rent is figured on the total square feet occupied.

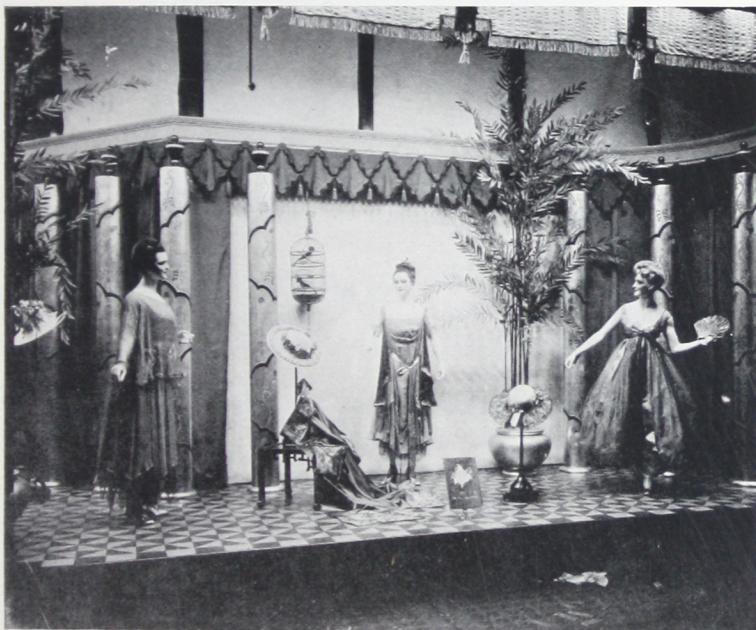


FIG. 1

The Pleasing and Simple Arrangement of Figures in this Display is Well Illuminated.
MAZDA C lamps in mirrored reflectors are placed along the upper front edge of the window and a neat valance entirely conceals the mechanism of lighting

A statistical expert recently reported some tests as to the value of window space to a store. Among other items, he reached the conclusion that the space devoted to a show window is worth a surprisingly large proportion of the rental value of the entire store. In one store, more than 100 feet long, the windows, only 2 feet deep, proved to be worth 12 per cent of the rent asked for the whole place.



FIG. 2

There are Exceptional Cases Where it is Desirable to Have the Light Source in the Window Itself. In this treat-
ment the candelabra form part of the decoration
and low candle-power lamps are, of course,
permissible

Now, it is axiomatic that the more hours per day a shop or piece of machinery is used the less proportionately become the fixed charges. Therefore, from an economic standpoint the valuable show window should be utilized every possible moment. If when the sun sets the show window becomes useless to the proprietor, he is actually losing money every hour there is anyone on the street. Fortunately, however, there is no necessity for the display to become valueless at nightfall, for the modern methods of supplying light cause the goods in many instances to appear even better than by natural light. The cost of proper window illumination is such a small item in comparison with the expense of merely having the window available that it can almost be neglected.

As a result of wide publicity on the general subject of window illumination, the standards have been constantly rising and win-

dow illumination has improved remarkably in the last few years. No longer does the well-posted display man decorate the window attractively and then have it spoiled by improper lighting.

General Considerations

Beyond a doubt the show window is a miniature stage, and the display man a scenic artist and stage director. He sets his scene, then places his actors and properties. He can learn much with regard to artificial lighting from the stage manager as the latter works in the theater.

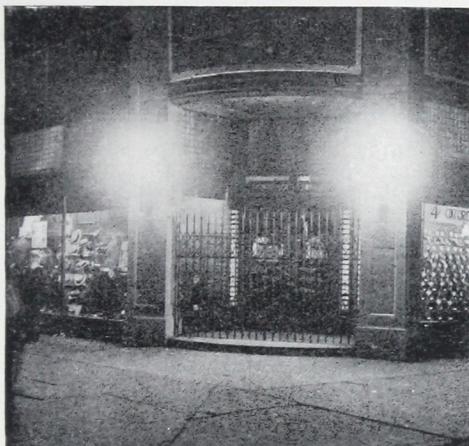


FIG. 3

Do Not Place High Candle-power Light Sources Near or Between Windows, as is Done in this Case. They distract the attention and prevent the display from being viewed with ease

The stage manager carefully conceals his light and he never annoys the audience or distracts their attention by permitting bright lamps to be visible. The display man should make it possible for the person on the sidewalk to view his display with equal comfort. It is true that on the stage, if it is desired to blind the audience during a magician's act or change of scene, lamps are located around the edge of the stage with reflectors to throw the light in the eyes of the assemblage. A window outlined with light sources gives a similar effect.

Of course, there is no rule to which there are not exceptions. Occasionally on the stage we find a room "set" where a hanging fixture, bracket, lights, or fireplace are part of the furnishings, but

you will notice that the ingenious stage manager never permits these to be very bright. Similarly, in a show window one or two fixtures with small lamps are permissible to carry out some decorative scheme.

Another case is a café window, cheap jewelry store window, or the like, where it is often desirable to place a fairly bright light in view to attract attention, but in these instances there are seldom any goods which the proprietor desires the public to examine closely and critically.

The lamps to light the display should never be in view, for the store is selling merchandise, not electric light or fixtures. The thought of the manner in which the window is lighted should never enter the casual observer's mind.

On the stage the mechanism of the lighting, the border lights, footlights, flood lamps and spot lamps are always masked or concealed from view. The window lighting equipment should be hidden with a drapery or other valance.

Lamps and Reflectors

The electric incandescent lamp has become practically the standard illuminant for show window lighting. It does not damage the goods or cause strong currents of air which deposit dust. There are no products of combustion to introduce moisture in the window, which often affects the display and in winter frost forms on the glass. Incandescent lamps and reflectors can be readily concealed.

The natural distribution of light from the incandescent lamp is about equal in all directions, hence to get the full benefit of the light all lamps should be equipped with proper and efficient reflectors, directing the light on the goods rather than allowing it to illuminate the ceiling of the window and escape into the street. In a theater the electrician does not waste a lot of light up in the flies or out in the auditorium, but provides each lamp or group of lamps with reflectors to utilize as much as possible of the light.

There are many types of reflectors suitable for window lighting which have been especially designed for this service, and so constructed as to give the correct distribution of light for windows of various dimensions. The typical show window reflector is what is known as the angle type, sending the light down and to the side rather than straight downward. Tests and experience have indicated that individual prismatic and mirrored glass reflectors are best suited for window lighting. They accurately control the distribution of light and are of high efficiency.



FIG. 4

A Mirrored Reflector for Show Windows Whose Height is Equal to Approximately Twice the Depth



FIG. 5

A Mirrored Reflector for Show Windows of Average Proportions, Height Being from 1 to 1½ Times the Depth

In choosing a mirrored glass reflector care should be taken to see that its surface is of such a character that it will not depreciate with time.

One advantage of the prismatic unit is the fact that a slight amount of light is transmitted through the glass, which serves to illuminate a painted sign or other advertising matter which might be placed on the upper portion of the window. Data on the proper reflector to chose for the particular window under consideration can be obtained from the manufacturers of window lighting reflectors.



FIG. 6

Prismatic Angle Type Window Reflector, 100-watt MAZDA C Lamp



FIG. 7

Prismatic Angle Reflector with Special Shield for Island and Corner Windows, 100-watt MAZDA C Lamp

Intensity of Illumination

The illumination necessary to properly show off the goods in a window will depend to a certain extent on the color of the goods on display. It is a well known fact that we see things by the light reflected from them to the eye. It is evident that a window with white or light colored goods will send back to the eye a great deal

of the light falling on them, while one containing dark goods will reflect but little light and hence appear dim if not well lighted. If the window is likely to have goods of all kinds on display it is necessary to plan the illumination so that the most difficult condition is fulfilled.



FIG. 8

Translucent Reflectors Are Used in This Instance and the Transparent Sign is Illuminated. The lighting is in keeping with the rules set forth in the text. Daylight MAMMA lamps are used to display the men's clothing in its daylight quality

In addition to the above consideration as to the amount of light required to properly illuminate the window, there are a number of variable factors which will also affect the result. For instance, the location of the street. If in the center of the town surrounded by lighting of a high intensity from the street lamps and adjacent signs, proportionally more light will be necessary to make the window stand out prominently than if it were on a side street or in the outlying portion of the city. In general, the size of the city will have some bearing on this question, for in most cases the larger the town the higher the standard of illumination. The depth of the window will also have a bearing on the size of the

lighting units, for in a deep window there is a greater area to be illuminated than in a shallow window. The type of reflector used is also important. The more efficient the reflector, the greater the amount of light reaching the goods from each lamp. The following table indicates the desirable watts per running front foot of window, using MAZDA C lamps equipped with efficient reflectors. This is, of course, based on average figures, and in applying these values local conditions may affect the result. For example, some small town may be very brightly illuminated, and in this case the windows really go in the next larger class of cities. These figures are based on common practice for the center or business portion of the town, and in outlying parts somewhat lower values may be permissible.

Size of City or Town	Depth of Window in Feet	Watts per Front Foot
Up to 5,000	2-4	25
Up to 5,000	4-8	25
Up to 5,000	Above 8	30
5,000 to 25,000	2-4	30
5,000 to 25,000	4-8	35
5,000 to 25,000	Above 8	50
Above 25,000	2-4	40
Above 25,000	4-8	60
Above 25,000	Above 8	75

Some merchants vary the intensity of light for different displays by substituting smaller lamps as occasion demands. A much more convenient scheme is to wire the window with say two circuits, and eliminate every third lamp when light displays are used and have the maximum illumination for a dark dress.

Color of Light

The show window is designed primarily to attract the crowd and compel their attention. Startling, novel features are in this respect an asset, yet it is not good taste to use methods which make the display garish. Artificial light is one of the best means at the disposal of the display manager to produce the desired effect. The possibilities in the way of colored lighting have not yet been fully appreciated. Most windows are still lighted with approximately the same kind of light that has been in use for many years. As pointed out before, the display manager is in reality a miniature stage director, and he has, therefore, something to learn from Belasco, Urban and Rhinehart. These great artists of stage direction do not confine themselves to the unmodified

light from the incandescent lamp, but use all colors of the spectrum. They obtain such colors by the use of gelatin screens or superficially colored lamps.

Colored window lighting was first brought to the general attention of the electrical industry in a lighting exhibit at the Atlantic City convention of the National Electric Light Asso-

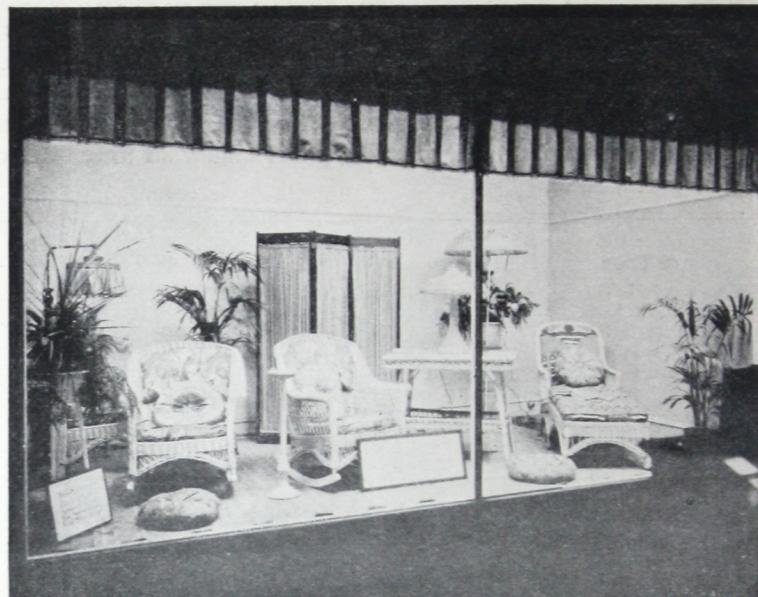


FIG. 9

View of Show Window Display Well Adapted to Colored Lighting. Green Overhead General Illumination, a Low Intensity of Unmodified Footlighting, Table and Floor Lamps Burning, and Two Overhead Spot-lamps with Purple and Orange Color Filters Combined to Make a Wonderfully Attractive Picture

ciation, and a full sized show window with a rather elaborate lighting layout attracted a great deal of attention. Color effects were obtained by the use of gelatin screens placed across the mouths of standard show window reflectors with MAZDA C lamps. Theatrical spotlights of a simple type were also used with color screens for special effects.

This particular display indicated some of the wonderful possibilities. It consisted of an exhibit of wicker furniture, with the window arranged somewhat like a summer porch. The combination of lighting which gave the most pleasing results consisted

of green general illumination, a low intensity of unmodified foot-lighting, portable table and floor lamps equipped with low-wattage MAZDA lamps, and two overhead spotlights furnished with purple and orange screens respectively, directing beams of light at the base of the portable lamp. It was made quite evident that all window display should not be treated in the same manner, but that each picture created by the display man should receive special attention.

The equipment used at Atlantic City has been demonstrated in a number of other places since that time, and attracted much attention from local merchants and display men. It is rather interesting to note all over the country in the show windows of the leading stores a growing use of the effects demonstrated.

The display man from his training and temperament is naturally artistic, and once having had the idea of colored lighting brought to him, he makes use of its possibilities in a remarkably artistic manner. He recognizes that the show window's purpose



FIG. 10

Prismatic Angle Type Reflectors and 150-watt Daylight MAZDA Lamps Provide a High Intensity of Illumination in this Window. The rules for correct lighting are observed

is to attract attention and to create a distinct impression. The possibilities along this line are unlimited. A window was recently shown on one of the most prominent streets of New York City which might be described in brief as follows:

The solitary exhibit in a particular section of the window consisted of a gigantic peacock with tail outspread. The lighting of this was accomplished by a relatively low intensity of blue illumination from footlights, the regular lighting turned off. Overhead at one corner of the window was located a standard incandescent stage spotlight so focused that it sent a circle of illumination approximately two feet in diameter to the tail of the bird. The combination was particularly impressive and excited much admiration, although the laymen did not realize that the special lighting was the thing which made the exhibit impress itself on his mind.

In art, all pictures are not of the same color, the same brightness, and do not express the same mood. Neither should every show window in a store be equally bright or lighted in the same manner. If one glances down a group of windows in a large department store they should not all appear the same. Each display should be treated differently. For some exhibits a pinkish tint of light might be suitable. For others a deep amber. Still others might require a light green, etc. The display man can readily determine just what effect he desires.

Every large store should have several sets of gelatin color screens which can be attached to the show window reflectors and the lighting modified as displays are changed. For pure color, an entire section of the window can be equipped with the color screens, or, if just a suggestion of color is wished, a few of the units can be equipped, leaving the others unmodified. It would be possible, for example, to have a display which required deep green lighting at one end, shading through amber to clear or unmodified lighting at the other end. This can be readily accomplished by the proper selection of color screens and their application to the show window reflectors. In addition to these, the large store should have available some standard stage suspension type spotlights which can be plugged in at will and used to bring out particular objects to a high intensity. A small footlight type of spotlight has also been developed which is used with or without color screens and is another valuable medium in the hands of display men.

It is not necessary for the merchant to install a great deal of special wiring or multiplicity of circuits in windows to get the

different effects, although to produce a colored light, of course, means considerable absorption, and hence a higher wattage is required for lighting any particular area. The pleasing effects secured, however, amply repay for this additional expenditure. If standard show window reflectors with 150-watt MAZDA C lamps are placed as close together as construction will permit, there is usually sufficient wattage to obtain any of the desired effects.

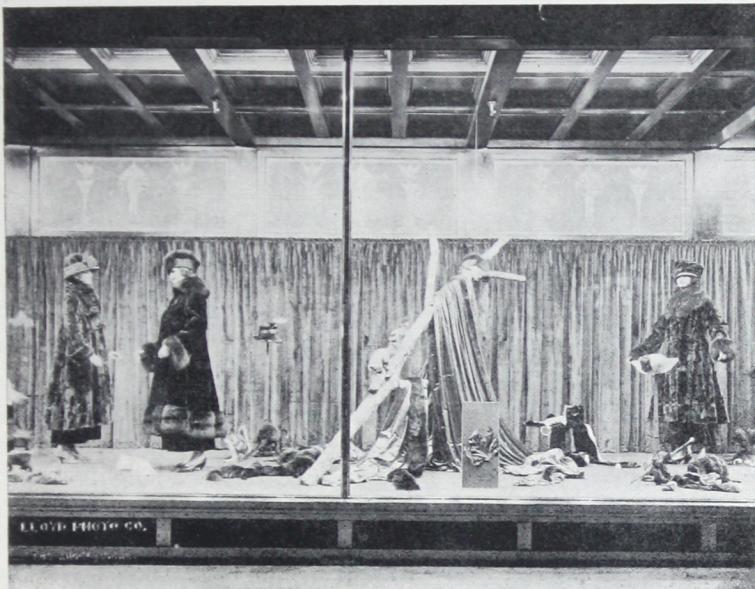


FIG. 11

Daylight MAZDA Lamps are Especially Valuable when Furs are to be Illuminated. The whites and blacks appear without the tinge of yellow so often present when ordinary artificial illuminants are used, and life and sparkle are given to the material

The Daylight MAZDA lamp has become another valuable medium in the hands of the display manager. An installation of Daylight MAZDA lamps causes the window to be distinctive and stand out prominently. A window so lighted is very striking and the goods are shown in practically their daylight value. It is not expected that the Daylight MAZDA lamp will effectually supersede the MAZDA for all window lighting, yet there are certain displays which are shown to their best advantage under this kind of light. Under the light of the Daylight MAZDA lamp linens and white goods appear pure white rather than slightly yellowish; men's

clothing, particularly if blue or black, shows up splendidly; furs, jewelry, shoes, neckties, and the like, are wonderfully well displayed under the Daylight MAZDA lamp. Along with the other colored lamps a set of these approximate daylight lamps for a couple of sections of the show window should be available, and when such displays as those mentioned are set up, these lamps should be installed to obtain the best effect. With colored lighting it is possible to vary the equipment as occasion demands, avoiding monotony and obtaining the best advertising value.

Direction of Light

On the stage there are many points at which lighting units can be located—overhead, below, and at the sides. Space in the show window will not permit such latitude. In general, the most useful lights on the stage are those in the border and proscenium strips. They supply diffused light from overhead and in front. It is true that footlights are used a great deal on the stage, but these are employed more as a matter of necessity and are required when the actor is down-stage or near the audience. He then gets beyond the range of the border lights and would be in comparative darkness if it were not for the footlights. Some stage directors, recognizing the disadvantages of footlights, have eliminated them by building special aprons behind which overhead lights can be placed farther out toward the audience than normally.

The actor, knowing that he is to appear before the footlights, adjusts his make-up to offset the reversal of all facial shadows which results from the light coming from below rather than overhead. The lay-figure, or model, in the show window is not decorated in this manner, so that footlights are usually out of the question in window illumination. A very little light from below, however, is sometimes desirable to cut the shadows at the base of the figure and show the footwear to better advantage.

In Fig. 12 are shown some of the effects of directions of light on a wax figure. Light changes the appearance so remarkably that it is hard to believe that the same figure was used for each of these photographs.

In general, the light must come from in front of the goods in order to avoid bad shadows. Shadows are necessary, but they should not be too sharply defined. We should have no difficulty in distinguishing objects in shadow, nor confuse the edge of the object with the edge of the shadow. The so-called shadowless

windows are unsatisfactory since the sense of size, proportion, distance and texture are either lost or so badly distorted as to repel observers rather than attract them.

Lighting units should be placed in the upper front part of the window. In order to introduce the certain element of diffusion mentioned above, a number of small lamps are preferable to one large unit giving the same amount of light. There may be exceptions to this rule.



FIG. 12

The Effect of Direction of Light on a Lay-figure; From Left to Right, as follows:
Illuminated with a strong beam of light from below—all shadows reversed;
illuminated with a strong beam of light from overhead—shadows harsh
and contrasting; illuminated from a semi-diffused light overhead
and in front—shadows soft and natural; illuminated with
completely diffused light—figure is flat and unattractive

The object of a show window is to attract attention by a striking appearance. It is a well-known fact that very startling effects can be produced by varying the direction of light. These can be readily investigated with the assistance of a small shadow box. The display man spends hours arranging an artistic window. He should devote a part of that time to the adjustment of the lighting. All displays should not be lighted in the same manner. The display manager should experiment a little. Some exhibits may require the predominating light coming from one direction, others from another angle. This can be done by varying the size of lamps used.

Example: Those at one end of the window may be 100-watt lamps, while those at the other end are, say, 25-watt. Great possibilities along this line present themselves.

Except under special conditions (where the display is practically on the floor of the window) lamps should never be placed in the middle of the show window ceiling, for this arrangement causes the front of the goods displayed in the foreground to be in shadow. Another objection to lamps so placed is that they cannot be effectively concealed.

A lamp should never be placed directly outside of the window. Some persons think this necessary to attract attention, but the glare from a high candle-power light source for this purpose is very bad. A light outside the window causes the sidewalk to be brilliantly lighted, which is not the best condition, for a window should stand out by contrast. Lamps outside of a window do not light the goods effectively.

Trimming and Background

Every merchant knows that proper window dressing is a very important factor in the standing of his store. The public is very prone to judge a store by its window display. As far as the lighting is concerned it is important to arrange the dress so that one article will not cast a shadow on another important display.



FIG. 13

A Window Very Well Lighted, with an Excellent Trim. One feature, however, has been overlooked. The upper part of the background is glass, to admit light to the store interior. Each light source is reflected from this. If a curtain had been provided these annoying images would have been eliminated

The window background should be arranged to suit the dress. It should be chosen to avoid specular reflection. A mirrored backing is particularly undesirable as it shows the reflection of the show windows on the opposite side of the street as well as the lighting units of the window itself. Many windows have glass above the paneled woodwork in the rear for the purpose of allowing daylight to enter the front portion of the store. To avoid reflections from this glass, shades that harmonize with the background should be provided to cover it at night.

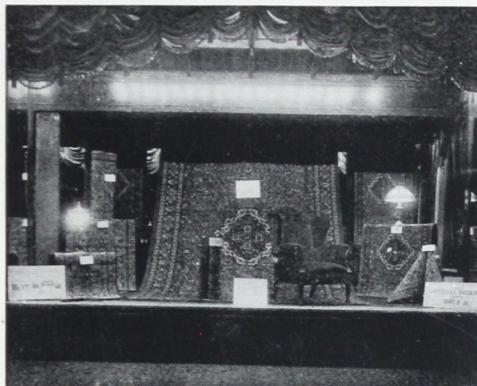


FIG. 14

A Window, the Roof of Which is Poorly Designed. Note the dense shadow cast by an overhanging beam. With such construction particular care must be taken not to continue the dress or trim above the shadow

Some of the windows of recent construction have a feature which is quite desirable from the lighting standpoint. They employ a light colored background with mat or dull finish. The light color of the background makes the window appear especially prominent while the dull surface prevents annoying reflections of the lamps. On the stage, one very seldom sees a scene painted a dark, dingy brown or gray, which appears dull no matter how much light is supplied. If the show window is to appear bright, dark wood backgrounds should not be used.

Special Considerations

There are two general types of windows—the open and the boxed-in. The open window is the type usually employed in the small store, and economies of lighting must be taken into careful con-

sideration here. Many small stores depend on the light from the show window to assist in lighting the front part of the store, the window being backed only a distance of two or three feet. For these windows the methods of lighting outlined may be applied, but often practical considerations demand that the window lighting equipment be more or less a continuation of the system used in the store



FIG. 15

The Effect of a Row of Light Sources in a Corner Window.
Special attention must be paid to conceal these as
far as possible from view

proper. In this case, where direct lighting is used the lamps should be bowl frosted, and the reflectors hung as high as possible to get them out of the ordinary field of view.

The higher grade stores have a dust-proof, boxed-in window, and the methods which have been discussed apply particularly to these.

For very shallow windows reflectors must be used which concentrate the light in a narrow angle straight downward. In a shallow window it is desirable to avoid much shelving and dress the window on the back and floor. This arrangement keeps shadows at a minimum. If shelves are essential, show case lighting equipment of small size must be installed to get the correct lighting effects.

A very serious defect in large window lighting is found where lighting units are necessary along both edges of a corner or island window. If special precautions are not taken, practically all the lamps down the opposite side or edge are fully visible. A trough reflector is especially bad in this respect. Individual reflectors are somewhat better. There is a special type of prismatic unit with a shield to conceal the filament from view that is very useful in

these instances. Another method that can be well applied is the use of shields or louvers between lighting units. These may consist of narrow metal or pasteboard strips placed perpendicular to the window and ceiling. In this manner but one or two lamps are visible at any particular location.

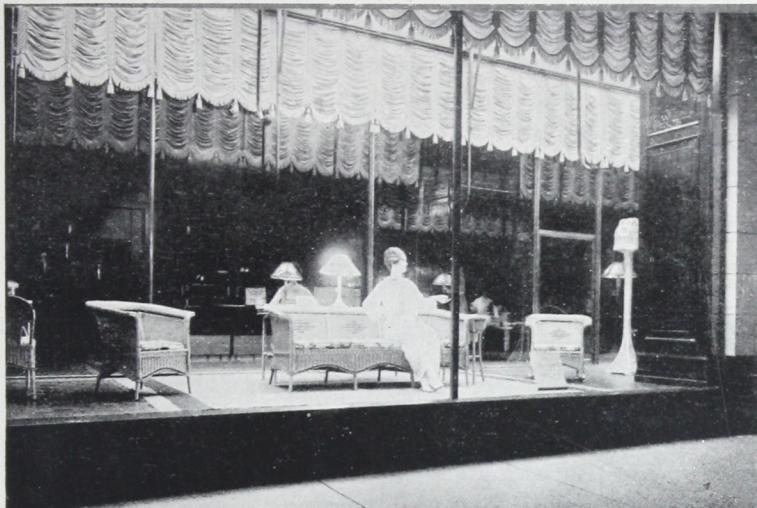


FIG. 16

Night View of an Island Show Window Which Has a Dome-shaped Ceiling Painted Flat White Illuminated with the Indirect Method from Mirrored Reflectors Located in a Cove Built Above the Plate Glass

In the lighting of an island window, there are very exacting conditions to be met which are not found in windows that are viewed from only one direction. Due to the fact that the material on display is seen from all sides, it is necessary to so illuminate it that it will appear well, regardless of the angle from which it is viewed. Any light sources in the field of vision will detract from the display as they are a source of glare. Some island windows have been constructed in which the ceiling is dome-shaped rather than flat, and a cove provided on all four sides of the window at the lower edge of the dome. Around this cove are located MAZDA C lamps in suitable mirrored reflectors so placed that the light is directed to the dome of flat white finish. With this arrangement no lamps or reflectors are visible and the method of illumination is, of course, totally indirect. In one very satisfactory installation, approximately 15 watts per square foot of floor area was employed.

Present Practice in Show Window Lighting

To obtain data on the present practice in show window lighting investigations were made of the equipment in the high class dry goods and department stores of forty cities scattered throughout the United States. A total of 125 stores were inspected.

The reflecting equipment was as follows:

One-piece mirrored glass angle reflectors.....	53
Mirrored trough reflectors with lamps horizontal.....	43
Prismatic glass angle reflectors.....	16
Aluminum finish steel angle reflectors.....	8
Dense opal bowl-shaped glass reflectors.....	5
	125

Figures were secured of the size of lamp and spacing of outlets; the grand average was 53 watts per running foot of window.

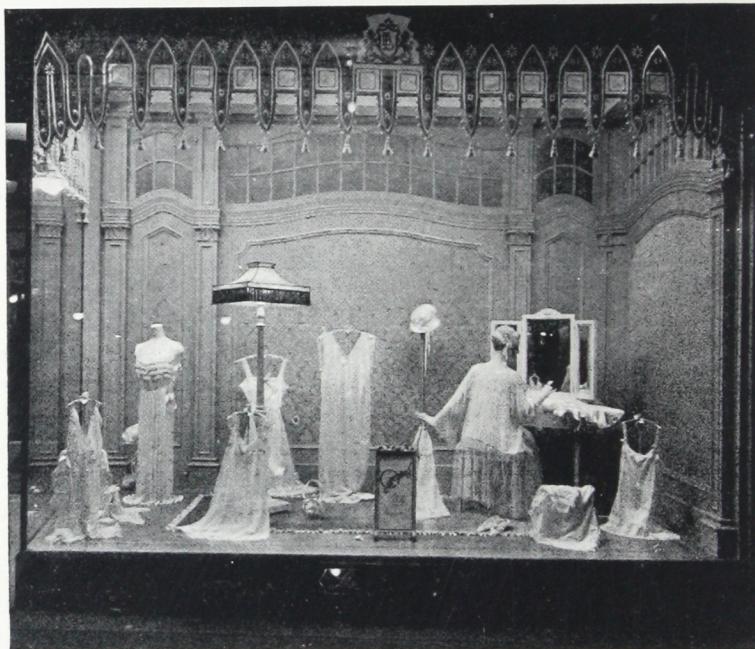


FIG. 17

A Light Colored Mat or Dull Finish Background is Particularly Well Suited for the Display Window. It makes the window appear bright with a minimum amount of light and prevents reflections of the light sources. A valance of unique design is employed in this instance to conceal the means of lighting

Show and Wall Cases

The show case and the wall case are miniature show windows within the store, and the necessity for their correct lighting is the same as that for the exterior show window. They should be well illuminated to attract the attention of the shopper to the merchandise within; they should stand out in contrast to the surroundings, and therefore should be more brightly illuminated.

Good illumination renders sales work easy, for close selection can be made without removing goods from the case. The decreased handling also eliminates shop wear of the goods on display.



FIG. 18

A Show Case Display Prominently Brought to the Attention of the Customer with the Assistance of Tubular Bulb MAZDA Lamps in Cylindrical Trough Reflectors. These units, being of small dimensions, are easily concealed from view

Show cases, whether they are of the counter or wall type, must be lighted by lamps placed within the case and hidden from view. The glass of the case forms a reflecting device which gives images of lighting units placed outside which are almost as annoying as the light sources themselves. The lamp must be concealed from the customer, and special attention must be given to the protection of the clerk's eyes. The latter is in a fixed position with regard to the show case, and, if bright spots are continually visible, fatigue, headache and eye-strain result.

The lighting unit must be quite small to give the least obstruction to a clear view of the display. The upper front edge of the show

case is the logical location for the lamp and reflector. This gives the correct direction of light, as pointed out under show windows.

The lighting equipment must be neat and in harmony with the finish of the metal parts of the fixtures. The modern show case is often almost entirely of glass, and neatness is, therefore, most important.



FIG. 19

Show Case Metal Reflector for 25- and 40-watt T8 Bulb
Tubular MAZDA Lamps

The wall case usually has a cornice at the top behind which the lighting equipment can be concealed. Its requirements, therefore, are not as severe as for the show case; nevertheless it is desirable that wall case equipment be small and inconspicuous.



FIG. 20

Spherical Bulb Candelabra Type MAZDA Lamps in Small
Mirrored Glass Angle Reflectors are Used in this
Example of Good Show Case Lighting

As low a wattage as possible must be used, for a show case quite frequently is air-tight. Circulation is at a minimum and any appreciable dissipation of heat will raise the temperature of the case to such a degree that the goods are likely to be affected. This is particularly true in confectionery and cigar stores. The MAZDA lamp is especially effective in this regard as its ratio of heat to light is relatively low.

The equipment must be constructed to eliminate fire hazard. Concealing the feed wires in small metal tubing is excellent practice.

The general considerations of intensity of light are the same as those indicated under the show window, light goods requiring less illumination than dark displays. A good average figure toward which to work is from 15 to 20 foot-candles.

Reflectors should be used to confine all the light to the show case and distribute it evenly over the trim. Needless to say, these should be of high reflective power to get the maximum light with the minimum energy expenditure.

Individual small mirrored glass reflectors are available for use with the 15-watt round bulb candelabra type lamp, and cylindrical trough reflectors for use with the 25- and 40-watt long, tubular lamps.



FIG. 21

Show Case Mirror Reflector for 15-watt
Style G Candelabra MAZDA Lamps



FIG. 22

Wall Case Mirrored Reflector for 15-watt
Style G Candelabra MAZDA Lamps

The show case, with its average dimensions of 30 inches high and 24 inches deep, requires a reflector which emits its maximum light at about 45 degrees from the vertical. The wall case is usually high and shallow, approximately 72 by 30 inches. This requires reflectors giving more concentrated distribution of light, with the maximum about 20 degrees from the vertical.

Layout for a Demonstration Window

The central station or electric shop should naturally be in the lead in any particular community with regard to lighting matters. If its show windows are equipped in such a manner that the effect of colored light can be demonstrated, they will no doubt awaken much interest on the part of the merchant in this subject. A number of prominent electrical dealers throughout the country have already established this practice:

By means of a flasher, the lighting effects are demonstrated in the electric shop and it forms an excellent means of attracting attention. It is not a good practice, however, in the average store to have a complicated wiring system or this variation by means of a flasher, for it is not the ultimate artistic end of window lighting.

In view of the interest on the part of the electrical fraternity in this subject, the following appendix gives some suggestions as to layout of windows for demonstrating the effects indicated under colored lighting.

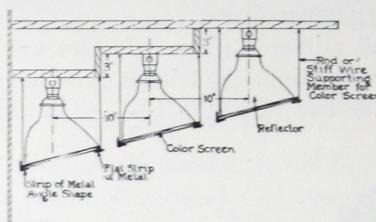


FIG. 23
Sketch showing Method of Mounting Reflectors and
Gelatin Screens for Tri-colored Window Lighting
in a Demonstration Window

The overhead standard window lighting reflectors should, in general, be arranged in three circuits which are called for purposes of convenience, *A*, *B* and *C*. To get a suitable number of lamps, it is necessary to have three rows in the average window. Reflectors should be placed as closely together as possible; i. e., on 1-foot centers, and arranged in steps somewhat as shown in Fig. 23. This is necessary to avoid one reflector interfering with light from the lamp in front of it.

Three outlets can be installed for each front foot of window; thus a 10-foot window would have 30 outlets. These should be divided approximately as follows:

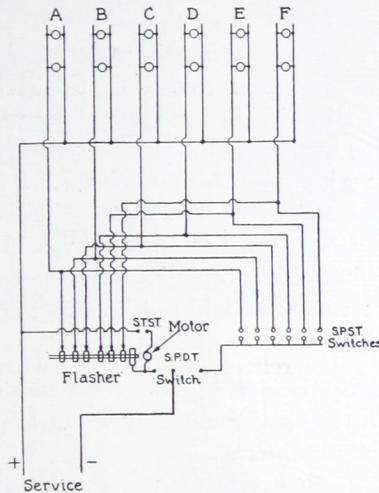
Circuit *A* 15, circuit *B* 9, circuit *C* 6; for other dimensions similar proportions apply. This combination gives the possibility of low, medium and high intensity.

When color screens are applied, the densest should be placed on circuit *A*, and the lightest on circuit *C*. For example, with the three primary colors, blue, green and red, circuit *A* should be blue, circuit *B* green and circuit *C* red. 150-watt MAZDA C lamps should be used. This may seem an abnormally high wattage consumption, but it is necessary on account of the absorption of the color screens.

Color Screens and Holder

A standard theatrical color slide consists of two sheets of tin with a circular hole. Gelatin screens are slipped between these two metal plates.

There are, no doubt, many methods which could be used for placing the color screens in proximity to the mouths of the reflectors. A suggested arrangement is as follows: A strip of metal, bent into an angle shape, is stretched the entire length of the window, approximately opposite the lower edge of each row of reflectors. A similar flat strip of metal is carried the length of the window opposite the upper edge of the mouths of the reflectors. These can be fastened to the ceiling by rods, stiff wire or any other feasible scheme. The color screens are then laid across these two metal strips, the angle portion holding them in place.



Wiring Diagram for Tri-colored Window Lighting

Spotlights

The effect of a concentrated beam of definite shape of rather high intensity is novel in the show window and has a distinct value. An inexpensive suspension type spotlight is on the market. This consists of a cylindrical housing socket, focusing device and lens for obtaining the spot. 500-watt round bulb concentrated filament MAZDA C lamps should be used in this device. Color screens are placed across the lens opening and changed as occasion requires.

The spot lamps should be on a separate circuit. For a small window one spotlight will be satisfactory and for a larger window it might be well to have two.

Receptacle Circuit

A few portable lamps are occasionally desired in the window and a fifth circuit, called *E*, should supply the baseboard receptacles serving these units.

Flasher

A low-speed adjustable sector flasher is necessary. Five circuits are required for the proposed layout and these should be of 1100-watt capacity.

Wiring

The general scheme of wiring is shown in Fig. 24. From the service one side leads direct to all lamps with a tap for the flasher motor. The other side of the line is led to a single-pole double-throw switch. One branch of this feeds the series of single-pole single-throw flush wall switches for manual control of the window lighting circuits. The other branch feeds these same circuits through the flasher with a tap for the motor. It is also necessary to have an auxiliary switch on the motor circuit, otherwise with the wiring arrangement shown the motor would be in operation when any of the individual circuits are thrown on manually, although the flasher control would not be affected.

Layout of Sectors

This, of course, is susceptible to a great many changes and is most flexible. With the arrangement shown in Fig. 25 the following combinations will be obtained:

Blue overhead; green overhead; red overhead; blue and green mixed overhead; red and green overhead; red and blue mixed overhead; red, green and blue overhead; blue overhead and spot lamp; green overhead, spot lamps and portable lamps; red overhead, spot lamps and portable lamps.

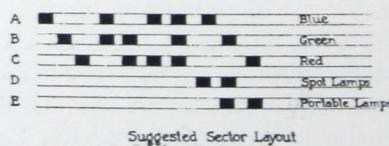


FIG. 25

General

It is not necessary to confine the color effect to the primary colors; amber, purple and the like are also very effective. If it is desired to use the window without color effect, the screens can be omitted from circuit *B*, for example, and this circuit left on permanently. This will provide a high intensity of unmodified window lighting of an excellent character.



FIG. 26

Night View of a Show Window in One of the Most Up-to-date Electric Shops in the Country. This is Provided with a Lighting System Identical with the Type Outlined

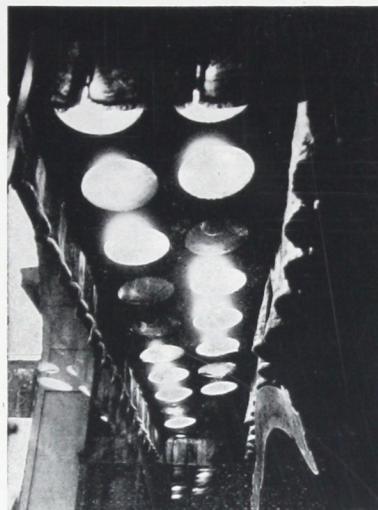


FIG. 27

View of the Reflecting Equipment and Color Screens Used in the Window Shown in Fig. 26. Special Construction is Utilized for Holding the Screens in Position

The Foot-candle Meter

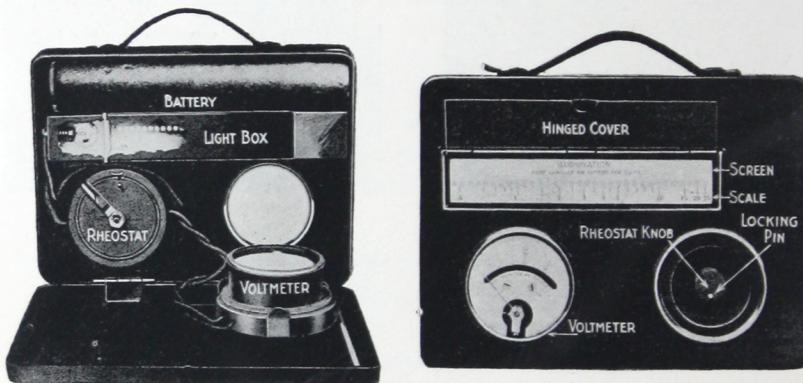
A demand for an inexpensive compact portable photometer has been felt for a long while and none has been available until quite recently. Now, however, the FOOT-CANDLE METER can be purchased from the MAZDA lamp manufacturers at the low price of \$25.00 and there is no excuse for the store manager or display man not knowing definitely the illumination on the counter or goods.

The FOOT-CANDLE METER is the invention of Dr. C. H. Sharp, of the Electrical Testing Laboratories, and was made into a

commercial proposition by the lamp manufacturers. It is entirely contained in a metal case, the dimensions of a medium size book, and the price includes a very neat leather carrying case.

The photometric screen consists of a sheet of opaque material through which a series of holes are punched at regular intervals. This is in turn covered by translucent paper. The screen is illuminated from below by light reflected from the white surface of a wedge-shaped box. Light is furnished by a miniature lamp at one end of the box fed by an ordinary flashlight battery, the voltage on the lamp being accurately controlled and indicated by a small resistance and voltmeter respectively.

With such an arrangement, it is evident that those spots near the lamp will be brighter than those at the opposite end. If the screen receives light from some external source at some point the paper surrounding the spot will be as bright as the spot, the spots at the right brighter than the surrounding area and those on the left darker. In this manner a photometric balance is obtained and indicated directly in foot-candles by figures printed on the scale.



To operate the FOOT-CANDLE METER, it is only necessary to turn the rheostat knob until the voltmeter needle is above a fixed mark on its scale. The instrument is set on the counter, display rack, desk or wherever it is desired to know the illumination, and a reading of the light balance made. The foot-candle illumination can thus be determined more easily than a pound of sugar can be weighed on a scale, and with almost equal simplicity to reading the temperature of a room on the thermometer.

Certainly, no progressive store manager can afford to be without this means of checking the illumination he is providing throughout

the store. A reading at stated intervals will tell him whether the porters are tending to their duties of cleaning lamps and reflectors. He does not need to climb a ladder and look into the lighting fixture when he believes dirt has been collected. He merely takes the FOOT CANDLE METER out of his desk, and knowing what the standard should be, checks the "light on the work."

Reasonably definite standards of intensity are required for different parts of the store or various kinds of merchandise, and the FOOT-CANDLE METER will enable one to determine whether these values are attained in practice. The wide awake manager knows that plenty of light increases sales. He can obtain much useful information by the aid of this instrument in observing the effect of different intensities of light on the appearance of particular displays.

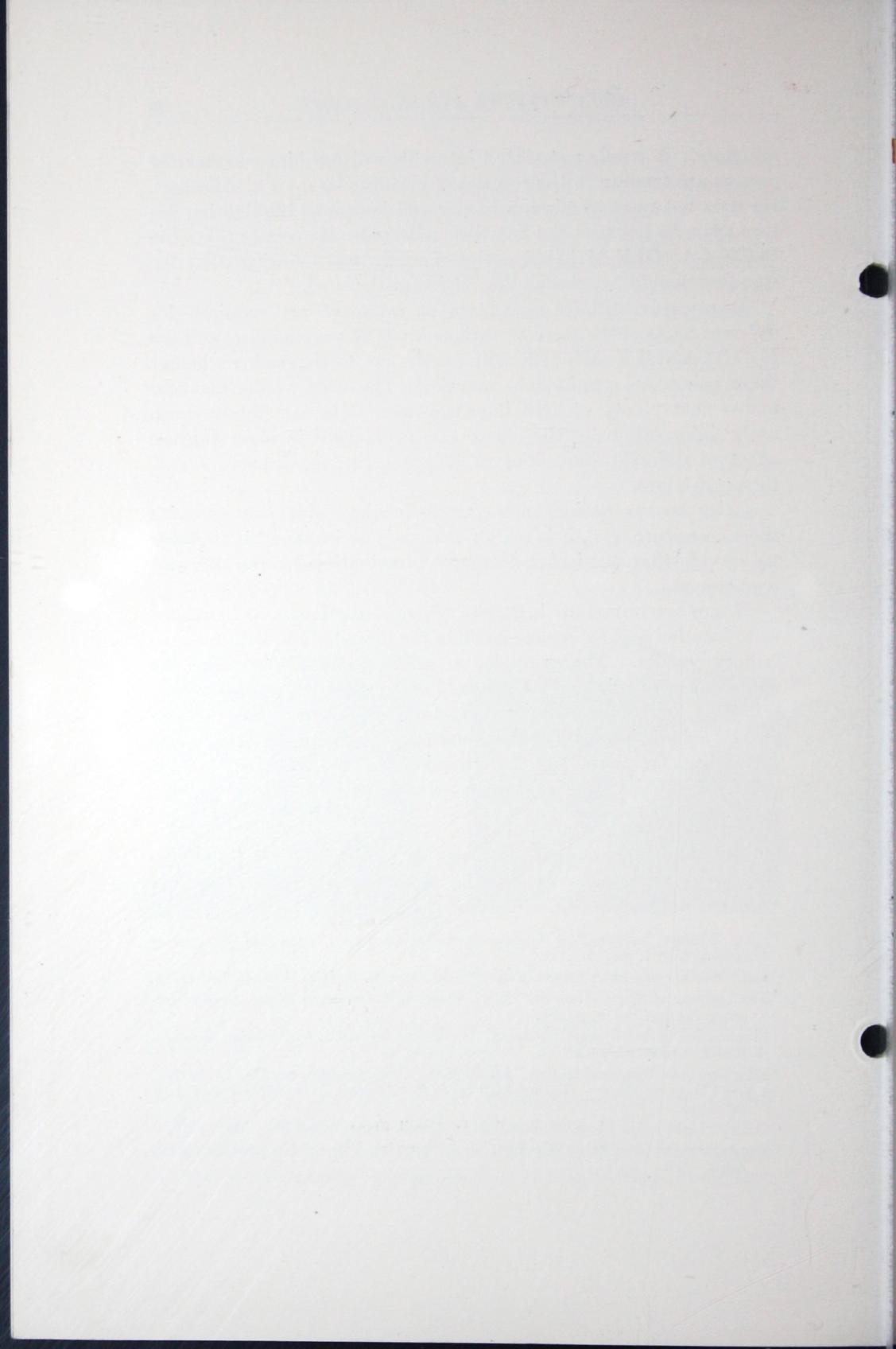
After he has decided upon some definite values for use with shoes, furniture, etc., it is merely necessary to interest the engineer to provide that particular degree of illumination for the different departments.

There are numerous instances where departments are changed as to location and no change made in the illumination, with unsatisfactory results. For example, a white goods display may be succeeded by a sale of dress goods of dark colors. The white goods reflecting light will make a satisfactory appearance under a comparatively low intensity of illumination. To make the dress goods attractive, far more light is required. The FOOT-CANDLE METER enables standards to be established and adhered to.

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